



TO STUDY THE EFFECT OF KINETIC CONTROL VERSUS PILATES EXERCISES ON CORE STABILITY AND GAIT OF CHRONIC STROKE PATIENTS

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ABSTRACT

Objective: This study aimed to investigate the effect of kinetic control versus pilates exercises on core stability and gait of chronic stroke patients.

Methods: A comparative study was done with 30 patients divided in the two groups. Patient in group A & group B were assessed and informed consent were taken. Patients in group A were given pilates exercises & group B were given kinetic control exercises. Treatment was given for 3 days / week for 8 weeks. Data was collected by means of Wisconsin gait scale, Trunk impairment scale Three reading were taken at specific intervals.

Conclusion: The study concluded that when we compared the effect of kinetic control retraining and Pilates exercises, both are equally significant in improving core stability and gait in chronic stroke patients.

INTRODUCTION:

In India the prevalence of stroke is estimated to be 203 per 100,000 people and it is projected to rank as fourth leading cause for disability by the year 2020.^{1,2} The pathophysiology of stroke and CNS trauma described by Richard J, when brain or spinal neuron become severely ischemic as a consequence of thrombi, emboli, or vasospasm that can flow hemorrhage or trauma resulting in appropriate loss of several of these components, the monoamine, neurotransmitters, norepinephrine, dopamine, serotonin may exacerbate the pathophysiological changes caused by initial ischemia.³ The deficits resulting having significant impact on independence, quality of life and productivity of survivors. Even after extensive rehabilitation, up to 50% of stroke survivors experience lingering motor deficits. Although the majority of stroke patients are able to walk independently, most do not reach a walking level that enables them to perform all of their daily activities.⁴ Compensatory movements occur in various parts of the body causing them to consume more energy than normal person do. This leads to lose in physical independence and reduction in gait and balance abilities.⁵ One component of balance is 'core stability', i.e. the ability to control the trunk in response to disturbances generated by movement of the limbs, or other perturbations. A cross sectional study revealed that there is a positive relation between trunk control and balance, gait, functional ability of patients with stroke.⁷ One of the neuro-developmental principles states that the control of movement proceeds from proximal to distal part of body. The trunk being the central key part of body, proximal trunk control is a prerequisite for distal limb movement control, balance and functional ability.⁷ Pilates exercise was founded by Joseph Pilates during 1920's. An emphasis is placed on control of body position and movement, as suggested by its original name "Contrology". Traditional principles of pilates exercises include centering, concentration, control, precision, flow and breathing.⁸ Pilates method allowed and encouraged movement early in the rehabilitation process, by providing needed assistance. According to the concept of Kinetic Control there are a few diagnostic levels, which are related, among other factors, to the fact that there are three muscle groups fulfilling different functional tasks. The foundations of the concept include four levels of evaluation of movement control: translation, direction, range and control of extensibility. Depending upon assessment results, assessment tools are used to improve muscular imbalance and dysfunction so that patient can gain control on their core.¹ The concept of kinetic control allows analyzing the movement pattern thoroughly, with the use of assessment of direction control for flexion, extension and rotation movement helps to identify a dysfunction of musculoskeletal system early enough to avoid pathologies and pain in patients and simultaneously minimizing the risk of irreversible structural changes. Pilates and kinetic control both are effective method of movement reeducation.

The aim of this study was to evaluate, between Pilates exercises and kinetic control retraining which one is more effective to improve core stability and gait in chronic stroke patients.

MATERIALS AND METHOD:

A comparative study was done with 30 patients divided in the two groups. Patient in group A & group B were assessed and informed consent were taken. Patients in group A were given pilates exercises & group B were given kinetic control exercises. Treatment was given for 3 days / week for 8 weeks. Data was collected by means of Wisconsin gait scale, Trunk impairment scale Three reading were taken at specific intervals.

PROCEDURE:

We have divided 30 patients into 2 groups both are experimental groups Group A and Group B Group A performed Pilates training program and group B performed kinetic control retraining program. The Pilates training program was based on mat classes lasting one hour per class, three times a week for 8 weeks.

The mat based Pilates training was composed of spine mobility exercises, upper limb exercises, and lower limb strengthening exercises.

Table 1: Pilates exercise program

	Program
Warm up exercises 10 min.	1. Breathing: 8 repetitions 2. Chin up and down: 8 reps 3. Spine stretch forward: 8 reps 4. Ankle mobilization: 8 reps 5. Tip toe stand: 8 reps 6. Shoulder rolls: 8 reps
Main exercises 40 min.	1. Abdominals with head support: 8 reps 2. Top leg pulse downs: 8 reps 3. Prone gulle series swimming exs: 8 reps 4. Bridging: 8 reps 5. Prone glute series heel squeeze: 8 reps 6. Push up: 8 reps 7. One hundred: 8 reps 8. Side kick: 8 reps
Finishing exercises 10 min.	1. Breathing exs: 8 reps 2. Swan: 8 reps

Group B performed Kinetic control movement assessment tests for same duration of 3 times a week for 8 weeks. One physical therapist was in charge for training. The therapist demonstrate the movement test and assist the patients to perform it. Movement's repetitions are 10-15 per set. The exercises composed of lumbar flexion dysfunction, extension dysfunction and rotation dysfunction.

Table 2. Kinetic control dysfunction retraining program

	Moevermnts
Flexion control	1) Standing trunk lean 2) Sitting forward lean 3) 4 point backward push 4) Double knee extension
Extension control	1) Thoracic extension 2) 4 point forward rocking 3) Prone double knee bent 4) Standing hip extension toe sliding
Rotation control (open chain)	1) Supine single heel slide 2) Side lying top leg turn out 3) Single knee flexion in prone 4) Single knee extension in sitting

Rotation control (close chain)	1) Pelvic side shift in standing
	2) Double knee swing in standing
	3) Thoracic rotation in standing
	4) Single leg bridge extension in crook lying

DATA ANALYSIS AND RESULTS:

Arithmetic mean, unpaired 't' tests were used to determine the significant differences between group A and group B. Repeated measures ANOVA test was used for within group A and B analysis.

Level of significance selected for the study was $p < 0.05$.

Repeated Measure ANOVA was done between the pre, mid & post for the variable TIS in Group A to check for the change within the variable. The F value for TIS was 48.45 ($p < 0.05$). The result for the variable was significant which showed that there were significant changes within the variable.

Post HOC Turkey analysis was done within the variable TIS to check the mean difference between pre, mid & post. The mean difference of TIS in all variables were significant which showed that there were significant differences within the variables, which shows that there order of superiority were post>mid>pre.

Repeated measure ANOVA was done between the Pre, mid and Post for the variable WGS in Group A to check for the changes within the variable. The F value for WGS was 114.59 ($p < 0.05$). The result for variable was significant which showed that there were significant change within the variable.

Post HOC Turkey analysis was done within variable WGS to check the mean difference between Pre, Mid, Post within Group A. The mean difference of WGS in all variables were significant which showed that there were significant differences within the variables, which shows that order of superiority were Pre>Mid>Post.

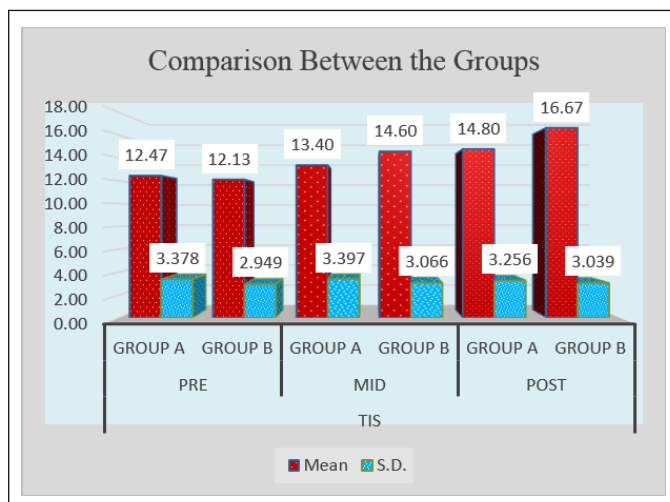
Repeated measures ANOVA was done between the Pre, Mid, Post for the variable TIS in group B to check for the changes within the variable. The F value for TIS was 73.42 ($p < 0.05$). The result for the variable was significant which showed that there were significant changes within the variable.

Post HOC Turkey analysis was done within the variable TIS to check the mean difference between Pre, Mid, Post within Group B. The mean difference of TIS in all variables were significant which showed that there were significant differences within the variables, which shows that there order of superiority were Pre>Mid>Post.

Repeated measure ANOVA was done between the 0 day, 2nd week & 4th week for the variable WGS in Group B to check for the changes within the variable. The F value for WGS was 15.39 ($p < 0.05$). The result for the variable was significant which showed that there were significant changes within the variable.

Post HOC Turkey analysis was done within variable WGS to check the mean difference between Pre, Mid & Post within Group B. The mean difference of WGS in all variables were significant which showed that there were significant differences within the variables, which shows that order of superiority were Pre>Mid>Post.

Unpaired t test for the variable TIS between Group A & Group B at Pre, Mid & Post.



Unpaired t test for the variable WGS between Group A & Group B at Pre, Mid & Post.

Unpaired t test was done between the Group A & Group B to check the changes between the groups. The t value for WGS was 0.804 ($P > 0.05$), 0.655 ($P > 0.05$) & 0.427 ($P > 0.05$). The result for the variable was not significant at Pre, Mid & Post which showed that there were no significant changes between the groups.

On the basis of description of the tables given above showing results of unpaired test to determine the no significant differences between Group A & Group B, but Repeated measure ANOVA shows significant difference for within group analysis. The result of study showed that both Groups showed significant improvement in TIS and WGS. However when compared both groups, there was no significant difference between the groups.

The analysis showed statistically significant improvement in both groups; however there was no significant difference between the group. so both the techniques was equally effective.

DISCUSSION:

This study aimed to compare the effects of pilates exercises program versus kinetic control retraining program on core stability and gait of chronic stroke patients. Our findings showed both approaches are significantly effective in improving core stability and gait in chronic stroke patients. There is no significant difference between the effect of pilates exercises and kinetic control retraining on core stability and gait of chronic stroke patients.

Studies have found that core training improves static and dynamic stability in chronic stroke patients. Sharma V stated that core acts as an anatomical basis for motion of distal segment, which provides stability for movement of lower limb. Xibo Sun studied the effect of core stability exercises in rehabilitation of stroke. Some researchers reported that improvement in stability and strength only impact indirectly on functional performance.

Pilates exercises developed by Joseph Pilates based on regulatory exercise training from spinal neutrality was found to be very effective in improving sense of balance, flexibility, muscles function and cardiopulmonary functions in chronic stroke patients. Pilates exercises based on eight Principles: control, breathing, flowing movement, precision, centering, stability, range of motion and opposition helps in improving gait. D. Newell reported that 8 week supervised Pilates exercises programme is helpful in improving balance and gait in healthy elderly subjects. Many studies have done which shows Pilates based exercises are effective in chronic low back pain by facilitating stabilization which may reduce fear of movement and helps in reeducation of movement. Studies showed 8 weeks of pilates exercise program is effective in improving core stability of chronic stroke patients. Pilates is a high amplitude movement works on proximal muscles group which are required for physical stability and balance against gravity, adjusting posture and prepare for movement of extremities.

Kinetic control movement dysfunction retraining works on global and local stabilizers which contains slow twitch fibers and have more muscle power which help in maintaining posture for long time.

Global muscle system is directly linked with our core stability. There is evidence of muscle dysfunction related to the control of movement system. The global muscles control range of movement and alignment, and evidence of dysfunction is presented in terms of imbalance in recruitment and length between the global stability muscles and global mobility muscles. Direction related restriction and compensation to maintain function is identified and related to pathology. The evidence of local and global dysfunction allows the development of an integrated model of movement dysfunction.

CONCLUSION:

The study concluded that when we compared the effect of kinetic control retraining and Pilates exercises, both are equally significant in improving core stability and gait in chronic stroke patients.

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